The 21 Century COE Project
Exploring New Science by Bridging Particle-Matter Hierarchy

Short-term Foreign Researchers

Research Report

Name: Professor Tang Zi Kang 湯子康

Affiliation:

Department of Physics, Hong Kong University of Science and Technology

Host Researcher in Tohoku University: Prof. Riichiro Saito

Your Stay Period in Japan: From Jan. 21st to Jan. 27th 2004

Title of Research in Japan:

Raman spectroscopy of 0.4nm single wall carbon nanotubes

---- Notes ---

Please write a research report of one or more pages and submit it with this cover to your host researcher till the end of this March.

Reseach Report

Tang Z. Kang Hong Kong University and Science and Technology

In the occasion of the visit to Prof. Riichiro Saito, Department of Physics, Tohoku Univ. from Jan 21st to 27th ,2004, by COE money of Tohoku Univ., we did many collaboration researches on carbon nanotubes. Here we list up my activity in Tohoku Univ.

1. Raman spectroscopy:
   I discussed with Dr. Alex Gruneis, Dr. Jie Jiang, and Prof. Riichiro Saito on optical properties and Raman spectroscopy of our ultra-small single-walled carbon nanotubes. An interesting experiment was proposed: In a back scattering configuration of incident circular-polarized laser beam along the tube direction, the Raman resonant behavior might be different for the right-hand circular polarization and the left-hand circular polarization. Thus, experiments of circular-polarized Raman scattering might give useful chirality information of the nanotubes.

2. Discussion with many faculty members in the Department of Physics and in the Institute for Materials Research
   Prof. Teruya Ishihara: have a nice discussion on optical properties of nano-scaled materials. His research on two-dimensional photonic band-gap materials is very impressive.
   Prof. Naoki Toyoda: we have an undergoing collaboration research on superconductivity of the ultra-small carbon nanotubes. Prof. Toyoda will use microwave technique to measure the one-dimensional superconductivity fluctuation of the nanotubes. By using this technique, the non-ohmic contact problem will be avoided.
   Prof. Shozo Sudo: have a useful discussion on nucleation of atoms/molecules on solid surfaces. The dependence of optical properties on the structural morphology is very interesting.
   Prof. Yoshihiro Iwasa (Kinken): Prof. Iwasa's experimental technique on metal doping into carbon nanotubes is very suggestive. We may have common interests in studying lithium-doped ultra-small carbon nanotubes in the near

future.

Prof. Kenji Tsuda (Tagen ken): The TEM and EELS equipments specially designed by Prof. Tsuda are very unique. His research might lead to a alternative way of structural characterization by means of electron diffraction. In comparison with X-ray diffraction, electron diffraction has much more selection in beam wavelength, though analysis of the affect of the high-order diffraction in the diffraction pattern is still a hard problem.

Prof. Takashi Kyotani (Tagen ken): there exists a high potential of collaboration in near future. Both of us are using template techniques to produce carbon nano structures, but using different series of templates. We can exchange experience and research ideas with each other.

3. Presentation of COE seminar

   I delivered a seminar talk in title of "Resonant Raman Scattering of 0.4 nm single-walled carbon nanotubes". The talk was given in Japanese.

4. On Sunday, we went to skii with Prof. Saito's family. A very good relationship between younger generations has been established, too.